11.0 PLANT SYSTEMS
11.7 MATERIAL TRANSPORT SYSTEM

11.7.1 CONDUCT OF REVIEW

This chapter of the revised draft Safety Evaluation Report (DSER) contains the staff's review of the material transport systems described by the applicant in Chapter 11.0 of the revised Construction Authorization Request (CAR). The objective of this review is to determine whether the material transport systems principal structures, systems and components (PSSCs) and their design bases identified by the applicant provide reasonable assurance of protection against natural phenomena and the consequences of potential accidents. The staff evaluated the information provided by the applicant for material transport systems by reviewing Chapter 11.0 of the revised CAR, other sections of the revised CAR, supplementary information provided by the applicant, and relevant documents available at the applicant's offices but not submitted by the applicant. The review of material transport systems design bases and strategies was closely coordinated with the review of accident sequences described in the Safety Assessment of the Design Bases (see Chapter 5.0 of this revised DSER), and the review of other plant systems.

The staff reviewed how the information in the revised CAR addresses the following regulation:

- Section 70.23(b) of 10 CFR states, as a prerequisite to construction approval, that the design bases of the PSSCs and the quality assurance program be found to provide reasonable assurance of protection against natural phenomena and the consequences of potential accidents.

The review for this revised CAR issue focused on the design bases of material transport systems, their components, and other related information. For material transport systems, the staff reviewed information provided by the applicant for the safety function, system description, and safety analysis. The review also encompassed proposed design basis considerations such as redundancy, independence, reliability, and quality. The staff used Chapter 11.0 in NUREG-1718 as guidance in performing the review.

11.7.1.1 System Description

Revised CAR Section 11.7 describes the functional requirements and design bases for equipment designed to transfer MOX fuel production material that is in a dry, solid form. Examples of such forms are PuO_2 and UO_2 powders, master blends of MOX powder, production batches of MOX powder, green pellets, sintered pellets, and fuel rods/assemblies. The equipment described in this section is located inside the MOX process (MP) area and shipping and receiving area. Due to the nature of the equipment, i.e., being inside and attached to, or supported by, gloveboxes, certain parts of this review relate to gloveboxes. The staff's review of the confinement system and gloveboxes can be found in Section 11.4 of this revised DSER. Descriptions of the MP process and the aqueous polishing (AP) process are provided in revised CAR Sections 11.2 and 11.3, respectively, and are discussed in the corresponding revised DSER sections. A description of the process control system is given in the revised DSER Section 11.6.

Different material handling equipment is used to transport material in the facility, depending on the form of the product, the container used to carry it, and the configuration of the process equipment that receives the container. Fuel material in the MP is in one of five forms: powder, pellets, rods, assemblies, and waste. The material handling equipment used are: (1) the receipt and opening of PuO_2 and UO_2 containers in the powder area; (2) pellet processing; (3) fuel rod and fuel assembly fabrication; (4) fuel assembly inspection and storage; (5) fresh fuel cask loading, and; (6) loading the fresh fuel casks onto over-the-road trailers.

Material handling equipment that can be used during this process includes, but is not limited to: scales, pallet trucks, fork lifts, drum-tilting devices, storage frames, handling monorails, pouring stations, feeding lines and control valves, hoppers, monorail cranes, standard and vibrating conveyors, turntables, traveling cranes, bridge cranes, gloveboxes, storage arrays, pneumatic transfer stations, airlocks, hoppers, impactors, funnels, can opening/closing devices, support frames, elevators, clamping devices, grippers, inspection stands, cleaning stations, jars, molybdenum boats, sintering furnaces, three-dimensional stackers, trolleys, winches, transfer tunnels, grinders, tray stackers, tilting tables, and air pallets. Various containers are also included in the list of material handling equipment, including: Department of Energy (DOE) Standard 3013 containers and transport casks, transfer containers, waste containers, and MOX fresh fuel casks.

DOE Standard 3013 containers provide primary and secondary confinement for plutonium received at the facility. This standard applies to plutonium-bearing metals and oxides containing at least 30 weight-percent Pu and uranium, as well as to plutonium-oxide materials with significant chloride contamination. The 3013 container is made up of an outer can, inner can, and convenience can. The outer and inner cans make up the primary and secondary containment, respectively.

Waste containers will be used to hold and ship MOX transuranic wastes. The waste transfer containers hold waste drums that provide the primary and secondary confinement for the waste. The drums are bag-lined before loading and sealed with a gasketed cover. The drums are also provided with filters to prevent pressurization and prevent the release of wastes from the drum.

MOX fresh fuel casks will contain multiple fresh MOX fuel assemblies for shipping. The fresh fuel casks will be qualified to meet the requirements of 10 CFR Part 71. The Nuclear Regulatory Commission (NRC) safety review of the fresh fuel casks for transportation is being performed separately from the facility review.

11.7.1.1.1 Function

The functions that the material transport system is designed to perform include:

- Transferring MOX fuel material and components from one point in the process to another, in accordance with process throughput, positioning tolerance, mechanism reliability, and radiological shielding requirements.

- Maintaining structural integrity and control of process containers to ensure that the confinement boundary is not breached.

- Maintaining structural integrity and control of process containers to ensure that criticality control functions are performed.

- Working with fire barriers, as required, to transfer material across process atmosphere or fire barrier boundaries.

- Transferring tooling and equipment spare parts during maintenance operations from point to point within the glovebox system.

The material handling equipment operation during those processes is summarized as follows:

The Pu powder arrives in a DOE safe, secure trailer to the shipping and receiving area at the facility. The 3013 containers, on a shipping pallet, are transferred from the truck to the shipping bay laydown area by forklift. The pallet is unpacked on a turntable and transported by roller conveyor to the 3013 storage area. Likewise, for the depleted UO_2 receiving and storage unit, UO_2 is delivered to the secured warehouse building in palletized drums. From there, they are sent to the MOX process area and are staged in a buffer area near the UO_2 drum emptying room. The 3013 containers are transferred to the transfer cask opening area to remove the overpack. A hoist lifts the 3013 package (of approximately 20 lb [9.1 kg]) onto a small roller conveyor. From there, the PuO_2/3013 storage crane transfers the 3013 package to PuO_2/3013 storage racks. When removed from storage, the package rides by conveyor to the decanning unit, which is fully enclosed in a glovebox. Inside this glovebox, the 3013 can is moved both horizontally and vertically and the outer can is removed. The inner can is transferred by pneumatic transfer tube to Level 4 of the AP building where the inner can is opened. Following this operation, the convenience can is opened. The opened convenience can is rotated and emptied into a homogenizer located in a glovebox immediately below the can opening glovebox. From there, the homogenized Pu is transferred by pneumatic lift to the electrolyzer on Level 3 of the AP building. The electrolyzer marks the beginning of the AP chemical processing of the Pu. AP chemical processing of the plutonium is discussed in detail in Sections 8.0 and 11.2 of this revised DSER.

Following AP chemical processing, the “wet” MOX material is returned to the MP process. The MOX material will remain within gloveboxes from this point until it emerges in a completed, sealed fuel rod. The MP process is described and evaluated in Section 11.3 of this revised DSER.

11.7.1.1.2 Major Components

Major components include transfer containers, process equipment, confinement systems, MOX fuel transport casks, and waste containers. The applicant stated in revised CAR Section 5.0 that the material handling system may have a plutonium dispersal hazard if the static barrier of the primary confinement system is damaged due to a loss of confinement/dispersal of nuclear material event or a load handling event. The applicant has identified the material handling PSSCs shown in Table 11.7-1 and 11.7-2, which describe the postulated events, the revised CAR-identified PSSCs, and hazard targets for each of these types of events, respectively.

Table 11.7-1, Revised CAR-Identified PSSCs for Loss of Confinement/Dispersal of Nuclear Materials Events

Loss of Confinement/ Dispersal of Nuclear Material Events Related to Material Handling Equipment	Identified PSSC	For the protection of the...			
		Facility Worker	Site Worker*	Public*	Environment
Corrosion	Material Maintenance & Surveillance Program†	✔	-	-	✔
Small breaches in glovebox boundary or backflow from utility lines	C4 confinement system	✔	-	-	✔
Leaks of AP process vessels or pipes within process cells	Process Cell	✔	-	-	-
	Process Cell Entry Controls	✔	-	-	-
	Process Cell Ventilation System Passive Boundary	-	-	-	✔
Rod handling operations	Material handling equipment**	✔	-	-	-
	Material handling controls**	✔	-	-	-
	Facility Worker Action	✔	-	-	-
Breaches in containers outside gloveboxes due to handling operations in C2 areas	3013 canister**	✔	✔	✔	✔
	Transfer container**	✔	✔	✔	✔
	Material handling controls**	✔	✔	✔	✔
Breaches in containers outside gloveboxes due to handling operations in C3 areas	3013 canister**	✔	-	-	-
	Transfer container**	✔	-	-	-
	Facility Worker Controls	✔	-	-	-
	Material handling controls**	✔	-	-	-
	C3 confinement system	-	✔	✔	✔

***NOTE 1:** There may be confinement systems or barriers not listed in this table that provide defense-in-depth protection for the site worker, the public, or the environment for which no credit is technically being taken by DCS.
****NOTE 2:** These items are material transport system PSSCs evaluated in this section of the revised DSER. The remaining items are discussed in other sections, as appropriate, of this document.
† Material Maintenance & Surveillance Programs have been identified by the applicant as a PSSC (see Section 5.6.2 of the MFFF revised CAR, Rev. 1).

The applicant stated in revised CAR Chapter 5 that the material handling system may have a load handling hazard from the presence of lifting or hoisting equipment used during normal operations or maintenance activities in the facility. A load handling event could occur when either a lifted load containing radioactive materials is dropped, or the load or lifting equipment impacts equipment containing radioactive material. Heavy load drops and other load handling events, as specifically defined in NUREG-1718 and NUREG-0612, are discussed in the revised CAR Section 11.10 and are evaluated in Section 11.10 of this revised DSER.

Table 11.7-2, Revised CAR-Identified PSSCs for Load Handling Events

Load Handling Events Related to Material Handling Equipment	Identified PSSC	For the protection of the...			
		Facility Worker	Site Worker*	Public*	Environment
AP Process Cells	Process Cell	✔	-	-	-
	Process Cell entry controls	✔	-	-	-
	Process Cell Ventilation System Passive Boundary	-	-	-	✔
AP/MP C3 Glovebox Areas	Material handling controls**	✔	-	-	✔
	Material handling equipment**	✔	-	-	✔
	Glovebox	✔	-	-	✔
	Facility Worker Controls	✔	-	-	-
	C3 Confinement System	-	✔	✔	-
C1 and/or C2 Areas/3013 Canister	3013 canister**	✔	✔	-	✔
	Material handling controls**	✔	✔	-	✔
C1 and/or C2 Areas/3013 Transport Cask	3013 transport cask**	✔	✔	-	✔
	Material handling controls**	✔	✔	-	✔
C1 and/or C2 Areas/Fuel Rod	Facility Worker Action	✔	-	-	-
C1 and/or C2 Areas/MOX Fuel Transport Cask	MOX Fuel Transport Cask**	✔	-	-	✔
	Material handling controls**	✔	-	-	✔
C1 and/or C2 Areas/Waste Container	Facility Worker Action	✔	-	-	-
C1 and/or C2 Areas/Transfer Container	Transfer container**	✔	✔	-	✔
	Material handling controls**	✔	✔	-	✔
C1 and/or C2 Areas/Final C4 HEPA Filter	Material handling controls**	✔	✔	-	✔
C4 Confinement/Spill inside glovebox	C4 confinement system	✔	✔	-	✔
C4 Confinement/Outside of MFFF Building	Waste transfer line	✔	✔	✔	✔
C4 Confinement/Facilitywide	MFFF building structure	✔	✔	✔	✔
	Material handling controls**	✔	✔	✔	✔

*** NOTE 1:** There may be confinement systems or barriers that provide defense-in-depth protection for the site worker, the public, or the environment for which no credit is technically being taken by DCS.
****NOTE 2:** These items are Material Transport System PSSCs evaluated in this section of the revised DSER. The remaining items are discussed in other sections, as appropriate, of this document.

11.7.1.1.3 Control Concept

The MP and AP process control systems use a distributed processing control system strategy, with the manufacturing process translated into control algorithms for each process step. The systems include normal, protective, and safety control subsystems that ensure the final product conforms to manufacturing specifications and minimize plant waste and risk. The normal control subsystem controls the manufacturing process, the protective control subsystem maintains industrial safety (protects personnel) and protects equipment, and the safety control subsystem ensures safety limits will not be exceeded and that undesirable operational conditions are prevented or mitigated.

11.7.1.2 Design Bases of PSSCs

This section describes the PSSC design bases contained in the MFFF revised CAR.

Material Handling Equipment and Controls: The applicant states in the revised CAR that material handling equipment and support structural members will be designed to prevent physical interaction with confinement boundary elements or PSSCs under worst-case loading associated with normal, upset, and design basis events. To achieve this design objective, the applicant intends to apply design principles such as: redundant brakes, with fail-safe design, on lifting equipment; structural oversizing of mechanical drive equipment; overspeed detection; mechanical stops; overtorque detection; electrical interlocks; component sizing; magnetic grippers; glovebox hoods, and; shielding. The applicant also states that, as an additional safety function, material handling controls will be designed to prevent the potential overpressurization of reusable plutonium oxide cans due to radiolysis or oxidation of Pu(III) oxalate, thereby preventing potential glovebox impacts from such overpressurizations. Material handling controls are also discussed in revised DSER sections 5.1.5.3, 11.6, and 11.7.1.1.3.

The design bases of material handling PSSCs include designing them to the following codes and standards:

- American National Standards Institute/America Institute of Steel Construction (ANSI/AISC). ANSI/AISC N690-1994, “Specification for the Design, Fabrication, and Erection of Steel Safety-Related Structures for Nuclear Facilities,” for design of components required to maintain structural integrity;

- American Society of Mechanical Engineers (ASME). ASME B30.2-1996, “Top Running Bridge, Single or Multiple Girder, Top Running Trolley Hoist Overhead and Gantry Cranes,” for design of overhead cranes;

- Crane Manufacturers Association of America (CMAA). CMAA-70-1994, “Specifications for Top Running Bridge and Gantry Type Multiple Girder Electric Overhead Traveling Cranes,” for design of bridge cranes.

- ASME B30.16-1998, “Overhead Hoists,” for design of hoisting equipment.

3013 Canister and Transport Cask: The outer can is designed and qualified for a 9 m [30 ft] drop onto a flat, unyielding surface while remaining leak-tight, as discussed in DOE-STD-3013-2000, “Stabilization, Packaging, and Storage of Plutonium-Bearing Materials,” and meets the requirements of 10 CFR Part 71. The inner can is designed to remain leak-tight after a drop of

1.3 m [4 ft.] onto a flat unyielding surface. The outer and inner cans are designed to withstand pressures of 4927 kPa [699 psig] and 790 kPa [100 psig] and are hydrostatically tested prior to use at a pressure 1.5 times that of the design pressure.   Both containers must be fabricated from ductile, corrosion resistant materials, such as 300 series stainless steel or better. Closure welding of the stainless steel must be done in such a way as to minimize the sensitization of stainless steel to stress corrosion cracking. Heat generation limits the mass of plutonium contained in the containers to less than or equal to 19 Watts [1.1 BTUs/minute]. Both of the containers are designed to hold the material for a maximum of 50 years. The DOE 3013 transport cask is a PSSC designed and qualified to protect the 3013 canister against transportation accidents. It will be certified to meet the free drop, crushing, and puncture requirements contained in 10 CFR 71.73.

Transfer Containers: Transfer Containers are designated as PSSCs that will be used to hold and ship MOX transuranic wastes. The waste transfer containers are designed, constructed, and qualified to meet the requirements of the U.S. Department of Transportation Specification 7A of the *Code of Federal Regulations, Title 49, Part 178, Section 178.350*.

MOX Fuel Transport Casks: The fresh fuel casks will be qualified to meet the requirements of 10 CFR Part 71. The casks may be stacked in storage frames in the truck shipping bay. To accommodate the load, the frames will be designed for the full weight of the shipping package including seismic effects. Because this cask will not be used in the facility prior to being licensed by the NRC, and because the cask, if approved, will be handled in the proposed facility according to its certification, the staff finds this design to be acceptable.

Seismic Design: Material handling equipment designated as PSSCs are designed and qualified according to national codes and standards, enabling them to perform their safety function during normal operations, upset conditions, and design basis events. The ability to safely shutdown the primary process is facilitated by the seismic design for the material handling equipment and structural support members. Equipment geometry and alignment must be maintained in order to have an orderly shutdown of the system. The system is designed to prevent physical interaction with confinement boundary elements or PSSCs under worst-case loading associated with normal, off-normal, accident, and design basis events according to the industry code ANSI/AISC N690-1994. The system will also be designed to meet the criteria provided in Regulatory Guide 1.100, Rev. 2, “Seismic Qualification of Electric and Mechanical Equipment for Nuclear Power Plants,” 1988, and IEEE Standard 344-1987, “IEEE Recommended Practice for Seismic Qualification of Class 1E Equipment for Nuclear Power Generating Stations.” Therefore, Duke, Cogema, Stone & Webster (DCS), in its mechanical equipment seismic qualification program, has committed to include attached piping loads, thermal loads, and live loads, such as tank sloshing, and in addition, applied loads are required to meet or exceed accelerations corresponding to their installed locations.

The seismic monitoring system is designed to satisfy the criteria provided in Regulatory Guide 3.17-1974, “Earthquake Instrumentation for Fuel Reprocessing Plants.” The design basis of the seismic monitoring system is that it provides sufficient data to evaluate the response of the confinement structure and other PSSCs to a seismic event and initiate a shutdown of process systems in the event of a high seismic event. The seismic system will meet the requirements of IEEE 603, “IEEE Standard Criteria for Safety Systems for Nuclear Power Generating Stations,” 1998.

The staff has reviewed DCS' commitment to these codes and standards and finds that they provide an acceptable basis for the seismic design of the MFFF material transport system.

Evaluation of Capacity: The staff evaluated the information provided by DCS in their revised CAR regarding the capacity of the proposed material handling equipment. The material handling equipment is designed such that, in the event of accident or off-normal condition, the equipment is designed to de-power or return to a shutdown condition. The throughput, or capacity, of the equipment peaks during normal operations or maintenance. The revised CAR describes the design of the equipment as being sized to handle the required throughput of shipping packages, containers, canisters, drums, casks, cans, powder, pellets, scrap, rods, and assemblies necessary for normal and off-normal operating conditions and maintenance. The revised CAR also discusses that the active systems, such as motors, power transmission systems and pass-throughs, carriers, actuators, end effectors, structural supports, sensors, and control systems will be based on the material throughput requirements for each process unit.

Capacities of the material handling equipment vary based on the operational through-put needed for the equipment, by the design and qualification of the equipment, and other specific design criteria. The material handling equipment designated as PSSCs must also retain their loads under all credible accidents and design basis natural phenomena events. Therefore, the capacity of these PSSCs may be greater than non-PSSCs. To accomplish these design requirements, equipment will be designed to (1) maintain clearance between equipment and the confinement boundary under all conditions, (2) include physical stops to prevent uncontrolled motion of payloads from breaching containment in the event of over-travel or seismic conditions, (3) ensure that actuating mechanisms, such as grippers, are designed to retain the payload under all conditions including loss-of-power and credible seismic events, and (4) maintain appropriate margins of safety in hoisting equipment. Capacity of equipment is not directly discussed by design codes, however, the staff accepts that, if PSSC equipment is built to the design codes referenced in the revised CAR, it will be designed to handle all loads, events, and configurations while maintaining its safety fnction.

Material handling equipment intended to suspend loads from flexible cables are designed using codes for cranes, monorails, and hoists, that includes appropriate minimum factors of safety. Hoisting equipment identified as PSSCs further de-rate their capacities according to safety factors from NUREG-0554 applicable to single failure-proof cranes. Process equipment used during maintenance is further de-rated to 65 percent of capacity according to project-specific design criteria. Hoists will be designed in accordance with ASME B30.16, "Overhead Hoists."

Material handling equipment that runs on fixed tracks are designed using structural design codes. Equipment classified as PSSCs are qualified in accordance with load combinations and acceptance criteria provided in ANSI/AISC N690 structural design code.

Evaluation of Redundancy and Diversity: The revised CAR describes the passive design of the equipment to handle shipping packages, containers, canisters, drums, casks, cans, powder, pellets, scrap, rods, and assemblies necessary for normal and off-normal operating conditions and maintenance. The staff reviewed the system design basis including the provision of active systems, such as motors, power transmission systems and pass-throughs, carriers, actuators, end effectors, structural supports, sensors, and controls. Material handling equipment includes devices that suspend loads from flexible cables and material handling equipment that runs on fixed tracks. Some of this equipment is designed to work external to a glovebox and other equipment is designed to work internal to a glovebox environment. Redundancy and diversity in the design is accomplished by: various factors of safety, types of equipment, and by the layering of active and passive controls that protect the confinement boundary. The facility design for material handling equipment inside gloveboxes includes redundant brakes, with fail-safe design, on lifting equipment, structural oversizing of mechanical drive equipment, overspeed detection, mechanical stops, overtorque detection, electrical interlocks, and component sizing based on worst case loading combinations. Various containers and casks are also discussed in the facility design. Each of these containers or casks is designed for different applications and are certified under federal regulations prior to use. The staff has reviewed the applicant's description of the material handling equipment regarding sysem diversity and, on the basis of standard industry practices, the staff finds the design to be acceptable. The staff notes that casks and canisters are likewise acceptable if they are used within their certification basis or if appropriate compensatory measures are made with consideration to the hazard to the facility and site worker, the public, and the environment.

Evaluation of Safe Shutdown: The staff evaluated the information provided by the applicant in their revised CAR regarding the ability to safely shutdown the proposed material handling equipment during normal, accident, and maintenance conditions. The material handling equipment is designed such that in the event of accident or off-normal condition, the equipment is designed to de-power in a fail-safe condition. Emergency power is not provided to the material handling equipment. For example during a loss of power, hoist brakes passively activate and end effectors such as magnetic grippers passively fail to a "closed" or retain load condition. In this way, the design ensures that in any accident or off-normal condition, all system loads are maintained and the confinement boundaries are not challenged by dropped or unrestrained loads. The staff finds this approach to be acceptable for the construction authorization.

Evaluation of Welded Construction: The Standard Review Plan (SRP) for the material transport system specifically mentions tank and piping systems be of welded construction to the fullest extent possible. For the purposes of this review, this guidance is applied to gloveboxes (a material handling PSSC). Continuously welded construction means the seams are ground smooth, which facilitates cleaning and minimizes holdup of powder, pellets, dust, or debris. The specification of welded construction also minimizes leakage paths and facilitates decontamination of gloveboxes. The applicant's proposed design for gloveboxes is evaluated in revised DSER Section 11.4. Based on the use of industry codes for the design and construction of welded material handling equipment, the staff finds this design basis to be acceptable.

Evaluation of Passive Features/Remote Operation: As discussed previously, the material handling equipment is designed such that, in the event of accident or off-normal condition, the equipment is designed to de-power in a fail-safe condition. Emergency power is not provided to the material handling equipment. For example, during a loss of power, hoist brakes passively activate and end effectors such as magnetic grippers passively fail to a "closed" or retain load condition. In this way, the design ensures that in any accident or off-normal condition, all system loads are maintained and the confinement boundaries are not challenged by dropped or unrestrained loads. The material handling equipment design also employs material handling equipment that is designed with engineered features to prevent active failures from impacting the glovebox walls. Based on the applicant's commitment in its design basis for these passive engineered features, the staff finds that the design provides an adequate level of protection against active failures.

For most operations, the process control system is designed to control the material handling equipment during normal process conditions. In the event of an off-normal or accident condition, additional control system elements are capable of overriding the normal process controllers to mitigate the potential hazardous condition. This equipment and functions are described in further detail in Section 11.6 of this revised DSER. During maintenance, process equipment and controllers are de-energized and equipment may be selectively energized under manual control of facility personnel engaged in the maintenance activities. Based on the control system design being for remote operation of process equipment, the staff finds this design for remote operation to be acceptable.

Evaluation of Radiation Safety: The staff review and evaluation of the radiation safety program is discussed in detail in Section 9.0 of this revised DSER. In general, the design basis for the material handling equipment hardware for radiation safety is as follows: use of design configurations to minimize powder/dust or debris; mounting of stainless steel casings on structural supports to prevent powder/dust retention; easy visibility and accessibility of parts for cleaning; use of sealed bearings or leak-free coupling mechanisms; use of appropriate surface quality or coatings for equipment in contact with powder; lubricant use is limited to extent practical; continuous and smoothly ground internal welds; re-entrant corners of large relative radius; and sealed powder handling channels. Based on its commitments to industry standards for surface finish and the general equipment design for minimization of powder holdup in equipment, the staff finds these provisions to be acceptable.

Evaluation of Corrosion Resistance: The material handling equipment proposed by the applicant is to be made primarily of stainless steel with the appropriate surface finishes to resist corrosion. The corrosion of carbon steel parts that cannot be painted will be prevented by a glovebox environment of nitrogen or dry air. For other areas, components may be coated or painted for corrosion resistance and ease of decontamination. Outside gloveboxes, painting systems will be used for materials located in C3b rooms to facilitate decontamination. In addition, the material condition of the equipment will be monitored by the material maintenance and surveillance programs. On the basis of industry codes and standards that specify system design accounting for corrosion as a standard industrial practice, the staff finds the design to be acceptable.

Evaluation of Personnel Protection: NUREG-1718 (Reference 11.7.3.16), Section 11.4.7.2, states that the need for hoods, gloveboxes, and shielding for personnel protection should be evaluated. These systems are generally required for processing operations involving more than gram quantities of plutonium or general operations involving 50 micrograms or more or plutonium in respirable form. In Section 11.8.2 of the revised CAR, the applicant states that personnel protection for these materials is provided by process cells and welded equipment confinement. Process cells contain equipment that handles radioactive materials in chemical solutions; that equipment being of a fully welded construction and not requiring routine maintenance. Equipment containing radioactive materials in the powder (MP) process is contained in gloveboxes in process rooms that provide equivalent confinement to fully welded equipment in process cells. In Section 11.4.7.1.3 of the revised CAR, the applicant documented its analysis of the accident scenarios for fire and impact events with gloveboxes. Based on the applicant's analyses and commitments described above, the staff finds this design for personnel protection to be acceptable.

11.7.2 EVALUATION FINDINGS

In Chapter 11.7 of the revised CAR, DCS provided design basis information for the material transport systems that it identified as PSSCs for the proposed facility. Based on the staff's review of the revised CAR and supporting information provided by the applicant relevant to the material transport systems, the staff concludes, pursuant to 10 CFR 70.23(b), that the design bases of the PSSCs evaluated in this revised DSER section will provide reasonable assurance of protection against natural phenomena and the consequences of potential accidents.

11.7.3 REFERENCES

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11.7.3.3 American Society of Mechanical Engineers (ASME). B46.1, “Classification and Designation of Surface Qualities.” ASME: 1995.

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11.7.3.6 American Welding Society (AWS). D1.1, “Structural Welding Code.” AWS: 1998.

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11.7.3.12 Institute of Electrical and Electronics Engineers (IEEE). Standard 344, “IEEE Recommended Practice for Seismic Qualification of Class 1E Equipment for Nuclear Power Generating Stations.” IEEE: 1987.

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11.7.3.16 _____. NUREG-1718, "Standard Review Plan for the Review of an Application for a Mixed Oxide (MOX) Fuel Fabrication Facility." NRC: Washington, D.C. August 2000.

11.7.3.17 Hastings, P., Duke Cogema Stone & Webster, letter to U.S. Nuclear Regulatory Commission RE Clarification of Responses to NRC Request for Additional Information (DCS-NRC-000074), December 5, 2001.

11.7.3.18 Hastings, P., Duke Cogema Stone & Webster, letter to Document Control Desk, U.S. Nuclear Regulatory Commission RE Clarification of Responses to NRC Request for Additional Information, February 11, 2002.